

Bias Category	Questions	Gilbert-Diamond et al., 2011	Wei et al., 2013
Selection bias	Were the comparison groups appropriate?	<p>Definitely low risk of bias</p> <p>Women were divided into two groups - "rice eaters" who reported rice consumption within two days of giving the sample, and "non-rice eaters" who did not report consuming rice within two days. The women recruited for this study were between the ages of 18-45, were all within 24 to 28 weeks of gestation, all reported using a private, unregulated water system for which arsenic levels were measured, and recorded their water, food, and rice consumption for three days leading up to providing a urine sample. Therefore, risk of bias from inappropriate comparison groups is low.</p>	<p>Definitely low risk of bias</p> <p>study participants were adults from NHANES cycles (2003-2006); NHANES uses stratified, multistage probability cluster sampling, so risk of bias is low.</p>

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<p>Performance bias</p>	<p>Did deviations from the study protocol impact the results?</p>	<p>Definitely low risk of bias - no deviations from the study protocol</p>	<p>Definitely low risk of bias - no deviations from the study design</p>

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Attrition/Exclusion Bias	Were demographic data incomplete due to attrition or exclusion from analysis?	Definitely low risk of bias - no data were excluded from reporting	Probably low risk of bias - exclusion was limited to individuals under 20 and participates with missing data or below the lower detection level for urinary arsenic species

	<p>Were the outcome assessors blinded to study group or exposure levels?</p>	<p>Probably low risk of bias - this study measured exposure to arsenic and rice consumption; so no health outcomes were examined; if considering the arsenic measurements in water/urine as outputs, then although not explicitly stated, it is unlikely those measuring the arsenic species/concentrations were aware of the demographic information</p>	<p>Probably low risk of bias - manuscript examined relationship between urinary arsenic concentrations, race, and rice consumption, so no health outcomes were measured; the basis of the analysis is NHANES data and although not explicitly stated, it's likely that analysis of urinary arsenic concentrations were performed blinded to demographics/dietary information</p>
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<p>Did researchers adjust or control for other exposures that are anticipated to bias results?</p>	<p>Definitely low risk of bias - smoking, water consumption, seafood, rice consumption considered as sources of arsenic</p>	<p>Probably low risk of bias - covariates included fish/shellfish consumption, source of drinking water; smoking was not explicitly examined</p>
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<p>Can we be confident in the exposure characterization?</p>	<p>Probably low risk of bias - exposures were estimated based upon self-reported intake of water, rice, rice products, and fish/seafood rather than having a duplicate diet analysis; different strains of rice have different iAs levels, so using an average for the brown rice strains available unlikely to reflect actual exposure; postpartum questionnaire on brown vs white rice consumption could introduce error into the exposure estimates; cooking water for rice not reported requires correction adjustment</p>	<p>Definitely high risk of bias - authors used total arsenic and DMA, rather than inorganic arsenic species, for analyses; dietary assessment based upon recollection could also introduce uncertainty</p>
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<p>Can we be confident in the outcome assessment?</p>	<p>Probably low risk of bias - this study measured exposure to arsenic and rice consumption; so no health outcomes were examined; methods used to measure arsenic species/concentration are appropriate</p>	<p>Probably low risk of bias - authors looked for correlations within NHANES data and didn't collect health outcome data; likely that NHANES used established methods to determine urinary arsenic levels and demographics information; dietary information collected using questionnaire could introduce uncertainty</p>
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Selective Reporting Bias	Were all measured demographics reported?	Definitely low risk of bias - measured demographics were reported	Definitely low risk of bias - all demographics information were reported
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Balazs et al. 2012	Diawara et al., 2006	Landolt et al., 1985	O'Rourke et al., 1999
Probably high risk of bias comparison groups were either treated CWS or untreated CWS, however, only 6 CWS had confirmed arsenic treatment plants - therefore, the "treated" CWS may not have reduced arsenic; also, selection criteria led to underrepresentation of CWS with <200 connections	Probably high risk of bias the soil samples were taken along 4 transects, transects based upon socioeconomic parameters rather than random selection, no apparent effort to match with areas of higher SES/lower industrial activity; The authors also had data including the baseline measure of soil metals for the United States and the Front Range Urban Corridor of Colorado. However, these measures were either over twenty years old or were taken from different soil depths.	Probably high risk of bias interviews of fisherman at 4 locations; anglers primarily Caucasian and U.S. born - discrepancy in sampling could introduce bias when comparing potential for exposures across demographics; frequency of fishing activities also varied	Probably low risk of bias population was part of the NHEXAS AZ study; population-based probability design used to select households; females over-represented, but ethnicity was consistent with census data so impact on comparison groups is likely minimal

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Probably low risk of bias - only deviation was if data were not available in PICME database, then used the Water Quality Monitoring database to calculate population size	Definitely low risk of bias - there were no deviations from the study protocol	Probably low risk of bias - The authors begin their interviews going in 6-hour block, 4 times a day. Well into their study, they change protocol by going at the most popular times to interview anglers.	Definitely low risk of bias - no deviations from the study protocol

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Definitely low risk of bias - demographics information was estimated based upon Census data and GIS information; there were no data exclusions	Probably low risk of bias - demographic information based upon US Census data, focus on minority and low SES	Definitely low risk of bias - no data were excluded from reporting	Probably low risk of bias - The authors do not state why 1225 households were contacted and 179 were chosen for sampling. Of these, the results of three houses were not reported, so the results show the sampling results of 176 households in AZ. Females were over-represented in the sample. The population contains one Hispanic for every two non-Hispanics, consistent across sex and age groups. The ethnicity relationships were consistent with the diennial census data.

Probably low risk of bias - study examined relationships between arsenic exposure, CWS, and demographics - there was no health outcomes measured or reported; considering the statistical analysis, the demographics and arsenic/CWS treatment data were collected from separate sources	Probably low risk of bias - this study used soil samples to measure arsenic concentrations; it is unclear if those measurements were made knowledge of the sampling site; however, the impact of that knowledge on the measurements is likely minimal; also if the "outcome" is the arsenic distribution, it's unlikely that prior knowledge would impact the GIS results	Probably low risk of bias - measurements of arsenic in fish tissue were independent of the fishermen interviews	Probably low risk of bias - the study selected households and the samples were collected and sent for analysis; although not specifically stated in the manuscript, it's unlikely the measurements were made with knowledge of the demographic information
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Probably low risk of bias - The authors do not control for other exposures, but were seeking out MCL violations for arsenic, which used direct testing for arsenic in the water. Because of the unlikelihood that another chemical would alter results for arsenic, the lack of control leaves no risk of bias.	Definitely low risk of bias - Because the authors use chemical analyses to assess the concentrations of the certain metals, there is not a large chance for confounding variables to cause altered levels of the soil metals.	Definitely high risk of bias only fish consumption considered; no consideration of dietary differences, water consumption, or smoking	Probably low risk of bias - exposure from air, water, and food were evaluated; also used duplicate diet study to confirm diet diary; smoking status not considered is limitation
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<p>Definitely high risk of bias - exposure estimates were based upon averages of the source concentrations, which assumed equal and independent contribution to the exposure that was constant over time; "treated" CWS did not explicitly treat for arsenic; arsenic exposures were not measured in individuals</p>	<p>Definitely high risk of bias - sampling was limited and non-random, with some oversampling of low SES areas; exposure is limited to soil concentrations and does not consider other sources of arsenic; no arsenic speciation data; no measures of exposure in humans</p>	<p>Definitely high risk of bias - only total arsenic measured; exposure is estimate based upon consumption and fish species caught; no direct measures of exposure</p>	<p>Probably low risk of bias - arsenic species were not presented, although the technique for measuring arsenic could distinguish between species and the authors acknowledge the difference in toxicity between organic and inorganic forms; exposure model does not incorporate weighting factors for route of exposure or individual susceptibility; no confirmation of arsenic exposure via biomarkers</p>
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Probably low risk of bias - paper measured relationship between CWS, arsenic exposure, and demographics and did not measure health outcomes; authors did sensitivity analyses and alternate statistical analyses to test assumptions	Probably high risk of bias - the distribution of the arsenic relies on nearest neighbor, which would be impacted by the selective sampling approaches taken	Probably high risk of bias - this study estimated exposure by comparing fish consumption/catch with measurements of arsenic in fish tissue; confidence in arsenic concentrations is high, but the estimates of consumption rely upon interview/memory	Definitely low risk of bias - exposure and demographics information were directly measured
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Probably low risk of bias - demographics information based upon census tract data and GIS analysis to estimate communities served by CWS, latino and non-white were combined; The authors group together all minority demographics into a single measure "people of color" including Latino and non-Latino people of color.	Probably high risk of bias - demographics were reported and based upon US Census data (i.e., self-identification); errors are unlikely to impact conclusions	Definitely low risk of bias - all demographics data collected were reported	Definitely low risk of bias - demographics information was reported
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Pellizzari et al., 1999	Tyrrell et al., 2013	Johnson et al., 2011	Postma et al., 2011
Probably low risk of bias - households identified as part of NHEXAS Region V study; used a stratified, four-stage, probability based design; differences between sample and census data for teenagers and income may introduce bias	Definitely low risk of bias - data collected as part of NHANES study; 5 independent cross-sectional waves of data; protocol for selection into NHANES was consistent. Likelihood of bias is low.	Probably high risk of bias - age, race, sex, water sources, and potentially smoking status were different between the populations, suggesting the comparison groups were different	Probably high risk of bias - study looked at households served by non-regulated water systems; population was not randomly sampled; demographics comparing the two populations sampled were not provided (just characteristics of the study population as a whole)

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Definitely low risk of bias - no deviations from study protocol	Probably low risk of bias - the authors describe deviations from the protocol (e.g., including multiple mediators in 1 model only for chemicals where all potential mediators were measured in the NHANES waves); however, they do not describe the process for arsenic	Definitely low risk of bias - no deviations from study protocol	Definitely low risk of bias - no deviations from study protocol

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Definitely low risk of bias - demographic data was collected and reported	Definitely low risk of bias - exclusion of subjects from the study was described; only Mexican hispanics, Non-hispanic whites, and non-hispanic blacks included in the analyses because of "very few non-Mexican hispanics and other ethnicity groups" in the data; although authors did not explicitly state threshold for analysis	Probably low risk of bias - The analysis was ultimately based on who took and submitted adequate toenail clippings. N=88 in Appalachia, n=151 in Jefferson County. The sample from Appalachia had a higher representation of whites, reflecting differences in racial distributions between the regions, but there was no exclusion of data.	Definitely low risk of bias - the study was a sample, so no demographics information was excluded

Probably low risk of bias - outcome (i.e., the measures of arsenic) was assessed on samples collected from households; although not explicitly stated, it's unlikely those measuring the arsenic concentrations were aware of the demographic information	Probably low risk of bias - this study looked for correlations within the NHANES data; although not explicitly stated in this manuscript, it is likely the NHANES samples are analyzed without knowledge of demographics	Probably low risk of bias - samples were collected as controls for another study; it's likely that measurements of As concentration in toenails were done without knowledge of the groups	Probably low risk of bias - study measured arsenic concentrations in tap water; although not explicitly stated, it's likely that measurements were done without knowledge of the household demographics
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Definitely low risk of bias - air, food, beverage, water, and dust sources were monitored for arsenic	Probably high risk of bias - fish and shellfish consumption were examined; however water consumption was identified as a potential mediator but was not investigated further because there was no data in NHANES; drinking water levels of iAs differ geographically and may have different impacts in different locations; also other dietary sources of arsenic were not analyzed	Probably high risk of bias - difference in water source were noted, but not controlled for in the comparison	Probably high risk of bias - dietary differences or smoking status not considered
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Probably low risk of bias - no arsenic speciation data; no confirmation of arsenic exposure via biomarkers, study doesn't provide details on sample collection/analysis, but as part of NHEXAS study they likely followed the procedures outlined previously	Definitely high risk of bias - blood and urine specimens taken from random subgroups selected by NHANES, but measures are total arsenic (organic and inorganic combined) or arsenobetaine; no measure of iAs	Definitely high risk of bias - no arsenic speciation; ~70% of samples were below level of detection for As, differences in diet could contribute to toenail As and diet was not considered as a source of arsenic	Not Applicable - study only measured arsenic in water; there was no measurement or estimate of exposure
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Definitely low risk of bias - exposure and demographics information were directly measured	Probably low risk of bias - this study looked for correlations within the NHANES data; authors not responsible for collecting outcome data, NHANES likely to use established methods	Probably high risk of bias - the association between arsenic exposure and demographics is limited because of the large number of arsenic samples that were below detection limits	Definitely high risk of bias - methods to measure arsenic in water were not indicated
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Probably low risk of bias - demographics information was collected but not shown in study	Probably low risk of bias - The authors have demographic information available from NHANES data and include it in the methods section as a population measured. However, the authors only report PIR among the total population. They do not break it down among different populations.	Definitely low risk of bias - all measured demographics were reported	Definitely low risk of bias - all demographics collected by interviewers were reported
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Walker et al., 2005

Probably low risk of bias - study looked at households with private well water consumption for potential arsenic exposure; households sampled in approximately same pattern and density as population; age, homeownership, and sex were different from populations served by public water supplies; recruitment directly in limited number of homes or direct intercept could introduce bias

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Probably high risk of bias -
dietary differences or
smoking status not
considered

Definitely high risk of bias -
no arsenic speciation,
exposure estimated by self-
reported consumption of tap
water (no biological
measures of exposure), no
individual measures of
exposure

Definitely low risk of bias -
measures of arsenic in water
had appropriate QA/QC
measures and were
performed using established
protocols

Probably high risk of bias -
The authors do not report
demographic results, although
they were collected in the
methodology